

REMARKS

Claims 1-2, 4-12, 15-21, 23-30, 32-35, 40 and 48-51 are pending after this amendment.

Claims 9 and 48 are currently withdrawn. Applicant respectfully requests rejoinder of the withdrawn claims upon allowance of a generic claim.

Corrections to address objections to the claims

Applicant thanks the Examiner for the careful review of the claims and has amended claims 5, 24-26 and 48 as suggested by the Examiner.

Compliance with 35 U.S.C. §112

The Examiner has rejected claims 6-9, 32-33 and 48 for lack of enablement. As understood, this rejection is based on the idea that: a) the presence of peaks or other features of the Raman spectrum depends upon the constitution of the specimen being analyzed; b) since Applicant does not control the constitution of the tissue being analyzed the specific Raman features recited in claims 6-9, 32-33 and 48 may be absent in any particular case; and c) if a specific Raman feature is absent then it is impossible to characterize the tissue based upon the (absent) Raman feature.

Applicant submits that claims 6-9, 32-33 and 48 are appropriately enabled. The claims relate to the Raman spectra of tissue. Tissue contains molecules that provide at least some Raman features in the ranges claimed in claims 8 and 9. Also, as discussed in the Specification, the absence of a Raman peak at a specific Raman shift can have significance in characterizing tissues (see e.g. [0074]). Claims 6, 7, 32, 33 and 48 have been amended to replace "a peak" with "an intensity of the Raman spectrum" which avoids the issue of whether a peak having an intensity of zero is still a peak.

Patentability over the cited references

Applicant submits that all pending claims are patentable over the cited references because the cited references do not perform tissue characterization using background fluorescence spectrum features and Raman spectrum features where the background fluorescence spectrum is a background to the Raman spectrum. Gellerman is cited as using background fluorescence in

combination with Raman spectroscopy. However, Gellerman treats background fluorescence as a nuisance to be removed and subsequently ignored.

35 U.S.C. §102 - Gellerman does not characterize tissue based on background fluorescence

The Office Action rejects claims 1, 24-27, 29, 34, 40 and 49 as being anticipated by US 6205354 (“Gellermann”).

Applicant respectfully traverses this rejection because claim 1 recites characterizing the tissue based upon “the Raman spectrum features and the background fluorescence spectrum features” [Emphasis Added]. Claim 49 includes a similar limitation.

Applicant submits that Gellerman fails to disclose or suggest this feature of independent claims 1 and 49.

Gellerman, as understood, does disclose in data and figures obtaining spectra of tissue that include resonance Raman peaks in the presence of tissue background fluorescence. However, Gellerman, as understood, teaches away from using the background fluorescence or any features of the background fluorescence or the raw data for diagnosis. Gellerman describes subtracting the background fluorescence to obtain a pure Raman signal. Gellerman then uses only the pure Raman signal (from which background fluorescence has been removed) for quantification of carotenoids and related molecules or for diagnosis. See, for example the following passages in Gellerman: Abstract - last sentence; col. 4, ln. 4-8; col. 5, ln. 64-67; col.10, ln. 42-51; col. 12, ln. 7-9; col. 12, ln. 26-29; col. 14, ln. 5-8.

Examiner has indicated that Gellerman discloses using background fluorescence to characterize the tissue in the passages at col. 6, ln. 21-31 and col. 8, ln. 53 to 55. Applicant submits that this is incorrect. The passage at col. 6, ln. 21-31, as understood, describes comparing the Raman signal of suspected malignant biological tissue being investigated to the Raman signal for normal tissue. The passage at col. 8, ln. 53 to 55 indicates that levels of carotenoids may be used to assess the risk of cancer. Neither of these passages, as understood, discloses characterizing tissue based upon “the Raman spectrum features and the background fluorescence spectrum features” as recited in claim 1.

Therefore, claims 1 and 49 are submitted to be patentable over Gellerman. Claims 24, 34 and 40 are submitted to be patentable over Gellerman at least by virtue of their dependancy from claim 1.

Compliance with 35 U.S.C. §103

Claims 28, 30 and 32

The Office Action rejected claims 28, 30 and 32 as being obvious over Gellerman. Claims 28, 30 and 32 are submitted to be patentable over Gellerman at least for the reasons provided above for claim 1. Further, Gellerman, as understood, fails to disclose the specific Raman shifts recited in claim 32.

Claim 33

The Office Action rejected claim 33 as being obvious over Gellerman and US 6069689 (“Zeng”). Applicant submits that Zeng does not remedy the above-noted deficiencies of Gellerman. Therefore, claim 33 is submitted to be patentable at least by virtue of its dependency from claim 1.

Claim 23

The Office Action rejected claim 23 as being obvious over Gellerman and US 6135965 (“Turner”). Applicant submits that Turner does not remedy the above-noted deficiencies of Gellerman. Therefore, claim 23 is submitted to be patentable at least by virtue of its dependency from claim 1.

Claims 2, 4-12 and 15

The Office Action rejected claims 2, 4-12 and 15 over Gellerman and US 5293872 (“Alfano”).

Alfano, as understood, fails to remedy the above-noted deficiencies of Gellerman.

Although Alfano discloses use of both Raman and fluorescence spectroscopy, Alfano uses different light sources/wavelengths to excite Raman and tissue fluorescence (see col. 8, ln. 34-38). Alfano detects fluorescence and Raman spectra using different fibres and detectors (126-1 and 127 for Raman spectra and 126-2 and 128 for fluorescence spectra). Alfano, as

understood, does not disclose or suggest characterizing tissue based on a background fluorescence spectrum wherein the “background fluorescence spectrum is a background to the Raman spectrum in the first wavelength range” as recited in claim 1.

Claims 2, 4-12 and 15 are therefore submitted to be patentable over Gellerman/Alfano.

Further distinction of claims 10-12 and 15 over Gellerman/Alfano

Claims 10-12 and 15 recite “illuminating the tissue with infrared light”. This feature further distinguishes Gellerman because Gellerman describes application of resonance Raman spectroscopy. In resonance Raman spectroscopy the excitation wavelength is chosen to correspond with a specific electronic- transition- related absorption peak of a molecule of interest. For this reason, excitation wavelengths for resonance Raman spectroscopy are usually in the UV or visible wavelength ranges. Gellerman uses excitation light in the wavelength range 450 to 520 nm (see col. 6, ln. 44) which is well outside near IR wavelengths. Gellerman could not use near IR light, as claimed in claim 10 because near IR photons do not have sufficient energy to induce the electronic transitions required for the resonant Raman spectroscopy used by Gellerman.

The Examiner mistakenly indicates that Gellerman disclosed the use of IR light because “Gellerman discloses using an Nd:YAG laser which emits in the infrared wavelengths”. The reason why this is incorrect is that Gellerman, uses a frequency doubled Nd:YAG laser (see col. 11 ln. 29). Such a laser emits visible light (532 nm), not IR light.

Gellerman indicates at col. 6, ln. 49 to 53 that other wavelength bands could be used (providing the example of UV light). However it is not correct that “any wavelength of light could be used if desired” as alleged in the Office Action since, as noted above, IR light photons are not energetic enough to induce the electronic transitions exploited by Gellerman. Applicant submits that a person of skill in the art would not consider Gellerman’s teachings to include performing resonance Raman spectroscopy as disclosed by Gellerman using near IR excitation light.

Therefore, claims 10-12 and 15 are submitted to be patentable over Gellerman/Alfano.

Claims 16, 17-21, 35, 50 and 51

The Office Action rejected claims 17-21, 50 and 51 as being obvious over Gellerman and US 5991653 (“Richards-Kortum”). The Office Action rejected claims 16 and 35 as being obvious over Gellerman and Richards-Kortum and Alfano.

Applicant submits that Richards-Kortum fails to remedy the above-noted deficiencies of Gellerman. Richards-Kortum, as understood, performs PCA analysis on “preprocessed data” (see col. 3, ln. 34-36). “Data preprocessing” is described at col. 13, last paragraph and col. 14 first paragraph. The “preprocessed data” discussed by Richards-Kortum can be seen to be a Raman spectrum after subtracting the background using a polynomial fitting method. Richards-Kortum, as understood, does not describe or suggest using “background fluorescence” for tissue characterization, as claimed.

Richards-Kortum describes using fluorescence measurements. However, the fluorescence used by Richards-Kortum was not background fluorescence to a Raman spectrum, as claimed. In Richards Kortum, fluorescence is excited at wavelengths of 317-357 nm, 360-400 nm and 440-480 nm (see col. 3, ln. 52). These are very different from the Raman excitation wavelength (789 nm, see col. 3, ln. 8).

Therefore, claims 17-21, 50 and 51 are submitted to be patentable over Gellerman/Richards-Kortum.

Claims 16 and 35 are submitted to patentably distinguish Gellerman/Richards-Kortum/Alfano because neither Richards-Kortum, as understood, nor Alfano, as understood, remedies the above-noted deficiencies of Gellerman.

Conclusion

Applicant submits that the foregoing amendments and remarks address every issue raised in the Office Action and that all pending claims of this application are now in condition for allowance. Reconsideration and allowance of this application are respectfully requested.

Respectfully submitted,

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